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Received 15 January 2004

CLAIMS:

1. A multistate magnetoresistive random access memory (MRAM) unit comprising:

a substrate,

a plurality of memory cells formed on said substrate,

a bit line and a word line in electrical contact with said plurality of memory cells,

each of said plurality of memory cells including a first magnetic layer, a second magnetic layer and a non-magnetic space layer,

wherein a heat element adjacent an individual cell in said plurality of memory cells heats said first magnetic layer of said cell to near its Curie point independently of other cells, and

the magnetization vector of said first magnetic layer is aligned with a magnetic field generated by a current applied to the bit line and word line.

2. The multistate magnetoresistive random access memory unit of claim 1 wherein said first magnetic layer has a first Curie point and said second magnetic layer has a second Curie point that is higher than the first Curie point.

3. The multistate magnetoresistive random access memory unit of claim 2 wherein, said first magnetic layer is a recording layer.

4. The multistate magnetoresistive random access memory unit of claim 2 wherein, said second magnetic layer is a read layer.

5. The mulitstate magnetoresistive random access memory unit of claim 2, wherein, said second magnetic layer is a soft magnetic layer.

6. The multistate magnetoresistive random access memory unit of claim 2 wherein the direction of the magnetization vector in said second magnetic layer is changed to an anti-parallel alignment with its initial magnetization vector by the magnetic field generated by the current in the word line during a read operation.

7. The multistate magnetoresistive random access memory unit of claim 2 wherein, the magnetization vector in said first magnetic layer can be aligned at a plurality of angles relative to the magnetization vector of said second magnetic

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layer.

8. The multistate magnetoresistive random access memory unit of claim 7 wherein the angle between the magnetization vectors of said first and second magnetic layers for an N state per cell MRAM, for the ith state, i=0 to N-1, is represented by the equation:

arccos (1-[2*i/(N-1)]).

9. The multistate magnetoresistive random access memory unit of claim 8 wherein in a four-state MRAM, the angles between the magnetization vectors of said first and second magnetic layers representing each state are, arccos(1), arccos(1/3), arccos(-1/3) and arccos(-1).

10. The multistate magnetoresistive random access memory unit of claim 7 wherein the magnetoresistance of said plurality of memory cells is dependent upon the angles between the magnetization vectors of said first and second magnetic layers.

11. The multistate magnetoresistive random access memory unit of claim 1 wherein the plurality of memory cells are coupled into an array with each cell being individually addressable.

12. The multistate magnetoresistive random access memory unit of claim 11 wherein, said plurality of memory cells is a plurality of stacked cells including a magnetic tunnel junction cell (MTJ), or a spin-valve cell (SV) or a pseudo spin-valve (PSV) cell.

13. The multistate magnetoresistive random access memory unit of claim 12 wherein the non-magnetic space layer is a non-magnetic conductive layer in a SV cell and an insulator tunnelling layer in a MTJ cell.

14. A method of writing data in a magnetoresistive random access memory (MRAM) unit comprising a plurality of memory cells, a bit line and a word line in electrical contact with said plurality of memory cells, a heat element adjacent an individual cell in said plurality of memory cells, the method including the steps of:

raising the temperature of a first magnetic layer in said individual cell to near its Curie point independently of other cells, thereby reducing the coercivity of said layer;

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writing a magnetization state in said first magnetic layer of said individual cell by passing a current through said bit line and said word line,

the current in said bit line and said word line acting cooperatively to align the magnetization vector in said first magnetic layer with a magnetic field generated by said current.

15. The method of claim 14 wherein the step of raising the temperature of said first magnetic layer is provided by applying an initial current through said individual cell.

16. The method of claim 15 wherein the initial current is applied to said heat element to heat said individual cell independently of other cells in said plurality of memory cells.

17. The method of claim 14 wherein, said plurality of memory cells is a plurality of stacked cells including a magnetic tunnel junction cell (MTJ), or a spin-valve cell (SV) or a pseudo spin-valve (PSV) cell.

18. The method of claim 17 wherein for MTJ memory cells, the heat element is a non-linear element.

19. The method of claim 18 wherein the nonlinear element is provided by a Zener diode in a reversed biased state during writing, connected to the junction of said MTJ memory cel s in series.

20. The method of claim 18 wherein said Zener diode acts as a cell selector when in the reverse b ased state.

21. A method of performing a read operation in a magnetoresistive random access memory (MRAM) unit comprising a plurality of memory cells, a bit line and a word line in electrical contact with said plurality of memory cells, a heat element adjacent an individual cell ~~in~~ said plurality of memory cells, the method including the steps of:

applying a current through said bit line <u>and said word line,</u>

determining the magnetization state of said first magnetic layer, wherein the resistance states of said first magnetic layer is dependent on the relative angles between the magnetization vectors of said first and second magnetic layers.

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said resistance states representing the magnetization states of the MRAM, and

reading data represented by said magnetization states stored in said memory cells.

22. The method of claim 21 wherein the resistance for an N state per cell MRAM, for the ith state, i=0 to N-1, is represented by the equation:

$$R_0 + \Delta R(i/(N-1))$$

23. The method of claim 21 wherein the direction of the magnetization vector in a second magnetic layer is changed to an anti-parallel alignment with its initial magnetization vector by a magnetic field generated by the current through said word line.

24. The method of claim 21 wherein the first magnetic layer is a recording layer and the second magnetic layer is a read layer.

25. The method of claim 19 wherein for a spin valve SV) MRAM, the current is applied through said bit line.

26. The method of claim 19 wherein for a magnetic tunnel junction cell (MTJ), the current is applied through said bit line and word line.